4.17 Vegetated Waterway or Stormwater Conveyance Channel

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Definition

A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

Purpose

Conveyance channels are used to dispose of runoff without causing damage by erosion or flooding.

Conditions

This standard applies to all sites where added channel capacity and/or stabilization is required to control erosion resulting from concentrated runoff and where such control can be achieved by this practice alone or in combination with others.

Design Criteria

Capacity

The minimum capacity shall be that required to convey the peak runoff expected from a 10-year, 24-hour storm or the storm specified. Peak runoff values used in determining the capacity requirements shall be by governing code or ordinance and by accepted engineering practices.

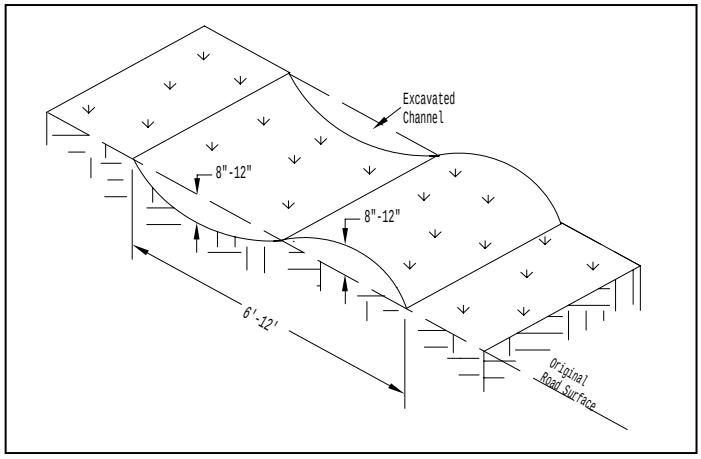

Figure 4.17.1 Typical Vegetated Waterway or Stormwater Conveyance Channel

The design of a waterway is based on determination of channel dimensions that will carry the estimated flow without damage to the channel of its liming. Vegetative linings vary in their protective ability according to type and density. Therefore, safe velocity under various conditions is a matter for careful consideration.

Velocity

In designing grassed waterways, care must be taken to ensure that the design velocity is well within the limits of permissible velocities for uniform good stands of each type of cover. Supporting documentation and calculations should be provided

Cross Section

The minimum design capacity of a waterway receiving water from developing areas, diversions, or other tributary channels shall be that depth required to keep the design water surface elevation in the channel to prevent overflow.

The bottom width of waterways or outlets shall not exceed 50 feet unless multiple or divided waterways or other means are provided to control meandering of low flows within this limit.

Drainage

Tile or other suitable subsurface drainage measures shall be provided for sites having high water tables or seepage problems. Where there is base flow, a stone center or lined channel will be required.

Stone Center

Stone center waterways, if necessary, shall be constructed as shown in Table 4.17.1 and stabilized with riprap according to applicable construction specifications. Stone size selection should be based on channel flow depth and velocity. Documentation and engineering calculations are to be provided.

TABLE 4.17.1

Permissible Velocities and Retardant Values for Vegetated Waterways

Vegetative Cover Type	For Capacity and V_2		For Stability and V_1		Maximum Permissible Velocity, V_1, fps
	Retardant Value	Plant Height (not mowed)	Retardant Value	Plant Height (mowed)	
Bermuda Grass	B	12 inches	D	2-6 inches	5
Bahia	C	6-12 inches	D	2-6 inches	4
Tall Fescue Grass Mixtures*	B	18 inches	D	6 inches	3
Sericea Lespedeza Weeping Lovegrass	B	18 inches	D	2-6 inches	3

*Mixtures of Tall Fescue, Bahia, and/or Bermuda

Note: For planting instructions, refer to Disturbed Area Stabilization (with permanent vegetation) Ds3.

Vegetative Retardant Factor

The design of a vegetated waterway is more complicated than for a bare channel since the value for "n" varies where grass linings are used. Analyses show that vegetation tends to bend and oscillate under the influence of velocity and depth of flow; thus flow-retardant values vary as these factors change.

Five general retardant curves designated A, B, C, D, and E have been developed for various cover conditions. The vegetal conditions under which the various retardant values apply are shown in Table 4.17.1. These cover classifications are based on tests in experimental channels when the covers were green and generally uniform. Professional engineering assistance is recommended. Publication SCS-TP-61 by the Soil Conservation Service is a useful reference.

TABLE 4.17.2

Velocity, Top Width and Depth for Parabolic Stone Center Waterways

	Grade 6	Percent	Grade 8	Percent	Grade 10	Percent	Grade 12	Percent	Grade 15	Percent
V	**8.0**	**10**	**8.0**	**10**	**8.0**	**10**	**8.0**	**10**	**8.0**	**10**
D	**1.3**	**1.6**	**1.1**	**1.3**	**1.0**	**1.2**	**0.9**	**1.1**	**0.8**	**0.9**
Q					**Top Widths**					
20							5		5	
25					5		6		6	4
30			5		6		7		7	5
35			6		7		8	5	8	6
40	6		7		8	5	9	6	10	7
45	7		8		9	6	10	6	11	7
50	7		9	6	10	7	11	7	12	8
55	8		9	6	11	7	12	8	13	9
60	9		10	7	12	8	13	8	14	9
65	9		11	7	12	9	14	9	16	11
70	10	7	12	8	13	9	15	10	17	11
75	11	7	13	9	14	10	16	10	18	12
80	12	8	14	9	15	10	18	11	19	13
90	13	9	15	10	17	12	20	13	21	15
100	14	10	17	11	19	13	22	14	24	16
110	16	11	19	13	21	14	24	15	26	18
120	17	11	21	14	23	16	26	17	29	20
130	19	12	22	15	25	17	29	18	31	21
140	20	13	24	16	27	18	31	19	33	23
150	22	14	26	17	29	20	33	21	36	24
160	23	15	27	18	31	21	35	22	38	26
170	25	16	29	19	33	22	37	24	40	28
180	26	17	31	20	34	23	39	25	43	29
190	27	18	32	22	36	25	42	26	45	31
200	29	19	34	23	38	26	44	28	47	33
220	32	21	38	25	42	29	48	31	52	38
240	35	23	41	27	46	31	53	33	57	39
260	38	25	44	30	50	34	57	36	62	42
280	40	27	48	32	54	36	61	39	67	45
300	43	29	51	34	57	39	66	42	71	49

Construction Specifications

1. All trees, brush, stumps, obstructions, and other objectionable material should be removed and disposed of so as not to interfere with the proper functioning of the waterway.

2. The waterway or outlet should be excavated or shaped to line, grade, and cross section as required to meet the criteria specified herein. It will be free of bank projections or other irregularities, which will impede normal flow.

3. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed waterway.

4. All earth removed and not needed in construction shall be spread or disposed so that it will not interfere with waterway functioning.

5. Applicable vegetative standards shall be followed for time of seeding, sprigging or sodding, liming and fertilizing, and site and seedbed preparation.

   Mulching shall be a requirement for all seeded or sprigged channels and shall be performed according to “Disturbed Areas Stabilization (With Mulching Only).”

Temporary protection during establishment should be provided when conditions permit through temporary diversions or other means to dispose of water. Erosion control fabrics designed to protect seed and slopes during the establishment of vegetation may also be used. These fabrics hold seed and soil in place to prevent erosion while the seed is germinating and until a vegetative cover is established. The fabric is constructed from a natural fiber that is biodegradable and will add organic matter to the soil upon decomposition. Installation methods should follow manufacturer recommendations.